Claims:

1. A method for mapping m input bits to 2^m modulation symbols of a two-dimensional symbol constellation, the method comprising:

forming a quarter-quadrant constellation of 2^{m-4} modulation symbols that are located in a first quadrant of the two-dimensional signal plane, the quarter-quadrant constellation having one-sixteenth the size of the two-dimensional symbol constellation;

uniquely associating each modulation symbol of the quarter-quadrant constellation with a respective m-4 bit label of the m input bits;

forming a quarter constellation of the two-dimensional symbol constellation by adding to the quarter-quadrant constellation three copies of the quarter-quadrant constellation rotated by -90 degrees, 180 degrees, and -270 degrees, respectively, and then displacing the quarter constellation by a shift value Δ such that the symbols coincide with symbols of the desired two-dimensional symbol constellation, wherein the quarter constellation has one-fourth the size of the two-dimensional symbol constellation;

uniquely associating each symbol of the quarter constellation with a respective m-2 bit label of the m input bits, wherein m-4 bits of the m-2 bit label are inherited from the quarter-quadrant constellation and two further bits of the m-2 bit label are used to distinguish quarter-quadrants of the quarter constellation;

forming the two-dimensional symbol constellation by adding to the quarter constellation three copies of the quarter constellation rotated by +90 degrees, 180 degrees, and +270 degrees, respectively; and

uniquely associating each symbol of the two-dimensional symbol constellation with an

m-bit label, wherein m-2 bits of the m-bit label are inherited from the quarter constellation and two further bits of the m input bits are used to distinguish quarters of the two-dimensional symbol constellation.

2. The method of claim 1, wherein of the two further bits of the m-2 bit label used to distinguish quarter-quadrants of the quarter constellation:

a value of [00] corresponds to a first quarter-quadrant of the quarter constellation having the quarter-quadrant constellation;

a value of [01] corresponds to a second quarter-quadrant of the quarter constellation having a quarter-quadrant constellation that has been rotated by -90 degrees;

a value of [11] corresponds to a third quarter-quadrant of the quarter constellation having a quarter-quadrant constellation that has been rotated by 180 degrees; and

a value of [10] corresponds to a fourth quarter-quadrant of the quarter constellation having a quarter-quadrant constellation that has been rotated by -270 degrees.

3. The method of claim 1, wherein of the two further bits of the m input bits used to distinguish quadrants of the two-dimensional symbol constellation:

a value of [00] corresponds to a first quadrant of the two-dimensional symbol constellation having the quarter constellation;

a value of [01] corresponds to a second quadrant of the two-dimensional symbol constellation having a quarter constellation that has been rotated by -90 degrees;

a value of [11] corresponds to a third quadrant of the two-dimensional symbol

constellation having a quarter constellation that has been rotated by 180 degrees; and

a value of [10] corresponds to a fourth quadrant of the two-dimensional symbol constellation having a quarter constellation that has been rotated by -270 degrees.

4. The method of claim 1, wherein:

the two-dimensional symbol constellation is a 256-QAM constellation;

the m input bits comprise eight bits $[y^7, y^6, y^5, y^4, y^3, y^2, y^1, y^0]$;

the 2^{m-4} bits are bits $[y^7, y^6, y^4, y^3]$;

the two further bits of the m-2 bit label are bits $[y^5, y^2]$; and

the two further bits of the m input bits are bits $[y^1, y^0]$.

5. The method of claim 1, wherein:

the two-dimensional symbol constellation is a 1024-QAM constellation;

the m input bits comprise ten bits $[y^9, y^8, y^7, y^6, y^5, y^4, y^3, y^2, y^1, y^0]$;

the 2^{m-4} bits are bits $[y^9, y^8, y^7, y^5, y^4, y^3]$;

the two further bits of the m-2 bit label are bits $[y^6, y^2]$; and

the two further bits of the m input bits are bits $[y^1, y^0]$.

6. The method of claim 1, wherein forming the quarter constellation further comprises repositioning a plurality of quarter constellation symbol positions.

7. The method of claim 6, wherein:

the two-dimensional symbol constellation is a 128 QAM constellation;

the m input bits comprise seven bits $[y^6, y^5, y^4, y^3, y^2, y^1, y^0]$;

the 2^{m-4} bits are bits $[y^6, y^4, y^3]$;

the two further bits of the m-2 bit label are bits $[y^5, y^2]$; and

the two further bits of the m input bits are bits $[y^1, y^0]$.

8. The method of claim 6, wherein:

the two-dimensional symbol constellation is a 512-QAM constellation;

the m input bits comprise eight bits $[y^8, y^7, y^6, y^5, y^4, y^3, y^2, y^1, y^0]$;

the 2^{m-4} bits are bits $[y^8, y^7, y^5, y^4, y^3]$;

the two further bits of the m-2 bit label are bits $[y^6, y^2]$; and

the two further bits of the m input bits are bits $[y^1, y^0]$.

9. The method of claim 1, further comprising forming the m input bits from a plurality of information bits by operating upon the plurality of information bits to form a Forward Error Correction (FEC) frame.

10. The method of claim 9, wherein the FEC frame includes an integer number of trellis groups.

11. The method of claim 9, wherein Reed-Solomon encoding is employed to form the FEC

frame.

12. The method of claim 1, further comprising forming the m input bits from a plurality of information bits by:

Forward Error Correction (FEC) coding the plurality of information bits to produce a plurality of FEC blocks;

interleaving and randomizing the plurality of FEC blocks; and

appending a frame synch trailer to the plurality of interleaved and randomized FEC blocks to form a FEC frame.

13. The method of claim 9, wherein the FEC frame includes an integer number of trellis groups.

14. A method for mapping m input bits to a two-dimensional symbol constellation, the method comprising:

forming a quarter-quadrant constellation of 2^{m-4} modulation symbols;

forming a quarter constellation of the two-dimensional symbol constellation by adding to the quarter-quadrant constellation three copies of the quarter-quadrant constellation rotated by -90 degrees, 180 degrees, and -270 degrees, respectively, and then displacing the constellation by a shift value Δ such that the symbols coincide with symbols of the desired two-dimensional symbol constellation, wherein the quarter constellation has one-fourth the size of the two-dimensional symbol constellation; and

forming the two-dimensional symbol constellation by adding to the quarter constellation three copies of the quarter constellation rotated by +90 degrees, 180 degrees, and +270 degrees, respectively.

15. The method of claim 14, wherein forming the quarter-quadrant constellation further comprises uniquely associating each symbol of the quarter-quadrant constellation with a respective m-4 bit label of the m input bits.

16. The method of claim 14, wherein forming the quarter constellation further comprises uniquely associating each symbol of the quarter constellation with a respective m-2 bit label of the m input bits, wherein m-4 bits of the m-2 bit label are inherited from the symbols of the quarter-quadrant constellation and two further bits of the m-2 bit label are used to distinguish quarter-quadrants of the quarter constellation.

17. The method of claim 16, wherein of the two further bits of the m-2 bit label used to distinguish quarter-quadrants of the quarter constellation:

a value of [00] corresponds to a quarter-quadrant of the quarter constellation having an unrotated quarter-quadrant constellation;

a value of [01] corresponds to a second quarter-quadrant of the quarter constellation having a quarter-quadrant constellation that has been rotated by -90 degrees;

a value of [11] corresponds to a third quarter-quadrant of the quarter constellation having a quarter-quadrant constellation that has been rotated by 180 degrees; and

a value of [10] corresponds to a fourth quarter-quadrant of the quarter constellation having a quarter-quadrant constellation that has been rotated by -270 degrees.

18. The method of claim 14, wherein forming the two-dimensional symbol constellation further comprises uniquely associating each symbol of the two-dimensional symbol constellation with an m-bit label, wherein m-2 bits of the m-bit label are inherited from the quarter constellation and two further bits of the m input bits are used to distinguish quadrants of the two-dimensional symbol constellation.

19. The method of claim 18, wherein of the two further bits of the m input bits used to distinguish quadrants of the two-dimensional symbol constellation:

a value of [00] corresponds to a first quadrant of the two-dimensional symbol constellation having the quarter constellation;

a value of [01] corresponds to a second quadrant of the two-dimensional symbol constellation having a quarter constellation that has been rotated by -90 degrees;

a value of [11] corresponds to a third quadrant of the two-dimensional symbol constellation having a quarter constellation that has been rotated by 180 degrees; and

a value of [10] corresponds to a fourth quadrant of the two-dimensional symbol constellation having a quarter constellation that has been rotated by -270 degrees.

20. The method of claim 14, further comprising forming the m input bits from a plurality of information bits by operating upon the plurality of information bits to form a Forward Error

Correction (FEC) frame.

21. The method of claim 20, wherein the FEC frame includes an integer number of trellis groups.

22. The method of claim 20, wherein Reed-Solomon encoding is employed to form the FEC frame.

23. The method of claim 14, further comprising forming the m input bits from a plurality of information bits by:

Forward Error Correction (FEC) coding the plurality of information bits to produce a plurality of FEC blocks;

interleaving and randomizing the plurality of FEC blocks; and

appending a frame synch trailer to the plurality of interleaved and randomized FEC blocks to form a FEC frame.

24. The method of claim 23, wherein the FEC frame includes an integer number of trellis groups.

25. A transmitter comprising:

Forward Error Correction block that receives a plurality of information bits and that produces a plurality of FEC blocks;

an interleaver that interleaves the plurality of FEC blocks;

a randomizer that randomizes the plurality of FEC blocks;

a frame synch trailer block that appends a frame synch trailer block to the plurality of interleaved and randomized FEC blocks to form an FEC frame having a plurality of input bits; and

an encoder that maps m input bits of the plurality of input bits to a two-dimensional symbol constellation that that was constructed by:

forming a quarter-quadrant constellation of 2^{m-4} modulation symbols;

forming a quarter constellation of the two-dimensional symbol constellation by adding to the quarter-quadrant constellation three copies of the quarter-quadrant constellation rotated by -90 degrees, 180 degrees, and -270 degrees, respectively, and then displacing the constellation by a shift value Δ such that the symbols coincide with symbols of the desired two-dimensional symbol constellation, wherein the quarter constellation has one-fourth the size of the two-dimensional symbol constellation; and

forming the two-dimensional symbol constellation by adding to the quarter constellation three copies of the quarter constellation rotated by +90 degrees, 180 degrees, and +270 degrees, respectively.

26. An apparatus for mapping m input bits to 2^m modulation symbols of a two-dimensional symbol constellation, the apparatus comprising:

means for forming a quarter-quadrant constellation of 2^{m-4} modulation symbols that are located in a first quadrant of the two-dimensional signal plane, the quarter-quadrant constellation having one-sixteenth the size of the two-dimensional symbol constellation;

means for uniquely associating each modulation symbol of the quarter-quadrant constellation with a respective m-4 bit label of the m input bits;

means for forming a quarter constellation of the two-dimensional symbol constellation by adding to the quarter-quadrant constellation three copies of the quarter-quadrant constellation rotated by -90 degrees, 180 degrees, and -270 degrees, respectively, and then displacing the constellation by a shift value Δ such that the symbols coincide with symbols of the desired two-dimensional symbol constellation, wherein the quarter constellation has one-fourth the size of the two-dimensional symbol constellation;

means for uniquely associating each symbol of the quarter constellation with a respective m-2 bit label of the m input bits, wherein m-4 bits of the m-2 bit label are inherited from the quarter-quadrant constellation and two further bits of the m-2 bit label are used to distinguish quarter-quadrants of the quarter constellation;

means for forming the two-dimensional symbol constellation by adding to the quarter constellation three copies of the quarter constellation rotated by +90 degrees, 180 degrees, and +270 degrees, respectively; and

means for uniquely associating each symbol of the two-dimensional symbol constellation with an m-bit label, wherein m-2 bits of the m-bit label are inherited from the quarter

constellation and two further bits of the m input bits are used to distinguish quarters of the two-dimensional symbol constellation.